

TO THE EDITOR:

Several writers have emphasized that any use of atomic energy entails a calculable risk, no less than those features of modern technology that lead to auto accidents and gastric ulcers. Nuclear warfare poses such an immediate and overwhelming peril to simple survival that concern for the ultimate genetic hazards of atomic energy betokens an almost unwarrantable optimism for the maintenance of world peace, but an optimism that is our only constructive recourse. However, if we postulate survival, we cannot overlook the long-run genetic problems entirely for preoccupation with the narrower issues of public affairs.

As the *Bulletin* shows, the attention of the informed public is rightly focussed on the production of deleterious mutations by penetrating radiations, but this emphasis may have obscured the possibly wider contact of genetic hygiene with industrial civilization. Radiobiological discussions have often taken the spontaneous mutation rate as a reference base, as an unavoidable evil which could not be averted and ought not be aggravated. However, recent studies have established two relevant facts: 1. A variety of chemical reagents can also induce mutations. Many of these compounds are special drugs, but the list also includes such common substances and natural metabolites as formaldehyde, hydrogen peroxide, and caffeine. 2. Still other chemicals can reverse these mutagenic effects and can also reduce the "spontaneous" mutation rate. Much (but by no means all) of this research has been conducted with microorganisms and more extensive studies are needed to establish, for example, whether the germ cells of man are physiologically insulated against such chemical insults from the environment. On the other hand, it may be possible to ameliorate the intracellular biochemical accidents that can now plausibly be considered as one source of "spontaneous" mutations.

From this perspective, the genetic hazards of atomic energy are but one facet of a much broader and correspondingly more urgent problem of chronic toxicity and the health of the public (and its future generations).

JOSHUA LEDERBERG

University of Wisconsin

P.S. In the above discussion, survival is "postulated." This is, of course, far too passive a response to such an urgent threat. The postulation is intended not to encourage passivity, but

to focus on the immediate issue. It should also be clearly understood that the broadening of the basis of genetic hazards does not in any way mitigate specific dangers from atomic energy. The role of radiations, and public response to it, may perhaps be compared to the role of poliomyelitis as one of many contagious diseases that are important in public health.